

**2008 ADDENDUM TO INTERIM MEASURES WORK PLAN
EAST HELENA FACILITY**

2008 GROUNDWATER INVESTIGATION WORK PLAN

Prepared by:
ASARCO LLC
100 Smelter Road
East Helena, Montana 59635

March 2008
Revised April 1, 2008

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Prepared by:

ASARCO LLC
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March 2008
Revised April 1, 2008



Linda Jacobson (3 Copies)
RCRA Project Manager
US EPA Region VIII 8ENF-T
1595 Wynkoop Street
Denver, Colorado 80202-1129

April 1, 2008

SENT BY FEDERAL EXPRESS

RE: 2008 Addendum to Interim Measures Work Plan, East Helena Facility, 2008
Groundwater Investigation Work Plan (Revised April 2008)

Dear Ms. Jacobson:

Asarco is submitting the enclosed 2008 Groundwater Investigation Work Plan (revised April 2008) for the Asarco East Helena Facility. The enclosed Work Plan has been amended to respond to EPA's March 28, 2008 comments. The revised Work Plan, compact diskette, and the certification signed by an officer of ASARCO are attached to this letter.

Sincerely,

A handwritten signature in black ink, appearing to read "Jon Nickel", is written over the word "Sincerely,". The signature is fluid and cursive.

Jon Nickel

Enclosure

CERTIFICATION
PURSUANT TO U.S. v ASARCO INCORPORATED
(CV-98-3-H-CCL, USDC, D. MONTANA)

I certify under penalty of law that this document, 2008 Addendum to Interim Measures Work Plan, East Helena Facility, 2008 Groundwater Investigation Work Plan (revised April 2008) and all attachment, were prepared under my direct supervision in accordance with a system designed to assure that qualified personnel gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and completes. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment for knowing violations.

Signature Thomas L. Aldrich
Name: Thomas L. Aldrich
Title: Vice President Environmental Affairs
Date: April 1, 2008

TABLE OF CONTENTS

LIST OF TABLES	ii
LIST OF FIGURES.....	iii
1.0 INTRODUCTION.....	1-1
1.1 SUMMARY OF GROUNDWATER MONITORING RESULTS.....	1-2
1.1.1 Water Supply Sample Results.....	1-2
1.1.2 Groundwater Monitoring Well Sample Results.....	1-3
1.2 SUPPLEMENTAL GROUNDWATER INVESTIGATION SCOPE AND OBJECTIVES.....	1-4
2.0 2008 SUPPLEMENTAL MONITORING WELL INVESTIGATION PROGRAM.....	2-1
2.1 SUPPLEMENTAL MIGRATION MONITORING WELLS	2-1
2.2 SUPPLEMENTAL SOURCE AREA MONITORING WELLS	2-2
2.3 CONSTRUCTION OF NEW MONITORING WELLS.....	2-2
2.4 SUBSURFACE SOIL SAMPLE PROGRAM.....	2-3
2.5 GROUNDWATER MONITORING AND TESTING PROGRAM.....	2-4
3.0 2008 SUPPLEMENTAL MONITORING PROGRAM SCHEDULE	3-1
4.0 REFERENCES	4-1

LIST OF TABLES

TABLE 2-1.	ANTICIPATED CONSTRUCTION FOR SUPPLEMENTAL MONITORING WELLS (h:\files\007 ASARCO\1054\IM WP Addendum – Rev 04- 2008\Tables 2-1 – 2-3 – Rev 04-2008.xls\Tab2-1 WellConstr)
TABLE 2-2.	MONITORING WELL SUBSURFACE SOIL SAMPLE COLLECTION AND ANALYSIS MATRIX (h:\files\007 ASARCO\1054\IM WP Addendum – Rev 04-2008\Tables 2-1 – 2-3 – Rev 04-2008.xls\Tab2-2 SoilSampMatrix)
TABLE 2-3.	GROUNDWATER TESTING, SAMPLE COLLECTION AND ANALYSIS MATRIX (h:\files\007 ASARCO\1054\IM WP Addendum – Rev 04-2008\Tables 2-1 – 2- 3 – Rev 04-2008.xls\Tab2-3 WaterSamp)

LIST OF FIGURES

- FIGURE 1-1. WATER SUPPLY WELL SAMPLING LOCATIONS (h:\files\007 ASARCO\1054\IM WP Addendum – Rev 04-2008\Figures 1-1 and 1-3.pdf)
- FIGURE 1-2. EXISTING GROUNDWATER MONITORING WELL SAMPLING LOCATIONS (h:\files\007 ASARCO\1054\IM WP Addendum – Rev 04-2008\Figures IM WP.pdf)
- FIGURE 1-3. GENERALIZED GEOLOGIC CROSS-SECTION (h:\files\007 ASARCO\1054\IM WP Addendum – Rev 04-2008\Figures 1-1 and 1-3.pdf)
- FIGURE 1-4. GROUNDWATER FLOW SHALLOW AND INTERMEDIATE AQUIFER-FALL 2007 (h:\files\007 ASARCO\1054\IM WP Addendum – Rev 04-2008\Figures IM WP.pdf)
- FIGURE 1-5. ARSENIC CONCENTRATIONS-SHALLOW AQUIFER-FALL 2007 (h:\files\007 ASARCO\1054\IM WP Addendum – Rev 04-2008\Figures IM WP.pdf)
- FIGURE 1-6. ARSENIC CONCENTRATIONS-INTERMEDIATE AQUIFER-FALL 2007 (h:\files\007 ASARCO\1054\IM WP Addendum – Rev 04-2008\Figures IM WP.pdf)
- FIGURE 1-7. SELENIUM CONCENTRATIONS-SHALLOW AQUIFER-FALL 2007 (h:\files\007 ASARCO\1054\IM WP Addendum – Rev 04-2008\Figures IM WP.pdf)
- FIGURE 1-8. SELENIUM CONCENTRATIONS-INTERMEDIATE AQUIFER-FALL 2007 (h:\files\007 ASARCO\1054\IM WP Addendum – Rev 04-2008\Figures IM WP.pdf)
- FIGURE 2-1. PROPOSED 2008 SUPPLEMENTAL GROUNDWATER MIGRATION INVESTIGATION MONITORING WELL LOCATIONS (h:\files\007 ASARCO\1054\IM WP Addendum – Rev 04-2008\Figures 2-1 – 2-2.pdf)
- FIGURE 2-2. PROPOSED 2008 SUPPLEMENTAL GROUNDWATER SOURCE AREA INVESTIGATION MONITORING WELL LOCATIONS (h:\files\007 ASARCO\1054\IM WP Addendum – Rev 04-2008\Figures 2-1 – 2-2.pdf)
- FIGURE 2-3. TYPICAL SHALLOW MONITORING WELL CONSTRUCTION (h:\files\007 ASARCO\1054\IM WP Addendum – Rev 04-2008\Figures IM WP.pdf)
- FIGURE 2-4. TYPICAL INTERMEDIATE MONITORING WELL CONSTRUCTION (h:\files\007 ASARCO\1054\IM WP Addendum – Rev 04-2008\Figures IM WP.pdf)

2008 ADDENDUM TO INTERIM MEASURES WORK PLAN EAST HELENA FACILITY

2008 GROUNDWATER INVESTIGATION WORK PLAN

1.0 INTRODUCTION

A Consent Decree effective May 5, 1998 between U.S. Environmental Protection Agency (EPA and ASARCO LLC (Asarco) (U.S. District Court, 1998) initiated the corrective action process in accordance with the RCRA program. As part of the Consent Decree, Asarco prepared several site investigation documents including:

- RCRA Current Conditions/Release Assessment (CC/RA) (Hydrometrics 1999a).
- Interim Measures Work Plan, East Helena Facility (Hydrometrics, 1999b).
- RCRA Facility Investigation (RFI) Work Plan (Hydrometrics, 2000).
- Phase I RCRA Facility Investigation Report (Asarco Consulting Inc. (ACI) 2003, revised 2005).

A complete listing of RCRA Consent Decree documents is contained in the Phase I RCRA Facility Investigation (RFI) report.

As part of the Consent Decree, several interim measures were implemented for groundwater between 1999 and 2001. These earlier interim measures (IM) performed as part of the Consent Decree are discussed in Section 1.2 of the RFI. In May 2002, a RCRA Interim Measures Work Plan Addendum (IMWPA) was prepared (Hydrometrics, 2002). The 2002 IMWPA addressed groundwater impact concerns in the intermediate aquifer within the City of East Helena and down-gradient residential groundwater supplies north of the Asarco plant site. These interim measures are discussed in Section 1.2.1.3 of the IMWPA.

The RFI addresses remaining elements of the site that are not addressed as part of the IM process and will provide sufficient data to develop corrective measures alternatives. The information gathered by the RFI will be used to prepare a RCRA Corrective Measures Study (CMS) for the East Helena Facility. The RFI is being conducted in two phases. The Phase I RFI addressed site characterization that has not been addressed in previous investigations or IM efforts. The Phase II RFI will consist of an assessment of human health and ecological risk. As part of Phase II, a Risk Assessment (RA) Work Plan will be developed in consideration of the data and evaluation presented in the Phase I RFI Site Characterization Report. The Phase II RA Work Plan will address risk assessment objectives, additional data requirements, and procedures for conducting the risk assessment. The development of the Phase II RFI Risk Assessment is discussed in Section 7.0 of the RFI report.

1.1 SUMMARY OF GROUNDWATER MONITORING RESULTS

Groundwater and surface water have been monitored at the East Helena Plant Site Area since 1984 as part of the CERCLA and RCRA programs. The monitoring program includes sampling of water supply wells including residential wells, municipal wells and industrial water supply wells. The current monitoring program includes sampling of 120 monitoring wells, water level measurement in 132 monitoring wells, and surface water sample collection from 6 sites in Prickly Pear Creek. Water supply well sample sites are shown on Figure 1-1. Monitoring well sample locations are shown on Figure 1-2. Figure 1-3 shows a cross-section of the aquifers monitored at the smelter site and in the city of East Helena. In 2007, arsenic and selenium concentrations were the focus of the monitoring programs.

1.1.1 Water Supply Sample Results

Based on the fall 2007 sampling campaign, water supply monitoring showed:

- All sampled downgradient residential drinking water well and municipal drinking water well arsenic concentrations are less than the Montana and EPA drinking water standards of 0.01 ppm.
- One down-gradient residential irrigation well had a detectable arsenic concentration of 0.042 ppm.

- One residential drinking water well upgradient from the plant had a detectable arsenic concentration of 0.017 ppm. Although this is above the drinking water standard of 0.01 ppm, the presence of arsenic in this upgradient well is a result of naturally occurring arsenic from the strata the well is completed.
- One downgradient residential irrigation well had a detectable selenium concentration of 0.34 ppm, which exceeds the drinking water standard of 0.05 ppm.
- The frequency of the sample program for four residential wells, located in the northwest area of the City of East Helena was increased to monthly, beginning September 2006. It is believed these residential wells have the highest potential to show changing trends in arsenic concentrations, should they occur.

1.1.2 Groundwater Monitoring Well Sample Results

Monitoring results for groundwater flow, arsenic concentrations, and selenium concentrations are shown in Figures 1-4, 1-5, 1-6, 1-7 and 1-8. Based on the fall 2007 sampling campaign, monitoring well sample results showed:

- Groundwater flow is generally to the north and northwest (see Figure 1-4).
- Primary sources of groundwater recharge are Upper Lake, Lower Lake and, in some locations, (City of East Helena) Prickly Pear Creek.
- Groundwater in the plant site area has elevated concentrations of arsenic.
- Historic and existing source areas on the plant site have resulted in a shallow arsenic plume (see Figure 1-5), and a deeper intermediate arsenic plume (see Figure 1-6).
- Primary remaining sources of arsenic in groundwater were the Speiss-Dross Area, and the Former Acid Plant Sediment Drying Area. These source areas were isolated by slurry walls constructed in 2006 (APSD area) and 2007 (S-D Area).
- The shallow aquifer arsenic plume is underlain by an intermediate aquifer arsenic plume that extends into the northwest portion of the City of East Helena.
- The width and extent of the intermediate aquifer plume is controlled by narrow coarse grained sand and gravel channel deposits.

- Most wells in the intermediate aquifer arsenic plume show arsenic concentrations that are seasonally variable, with no obvious trends of increasing or decreasing concentrations.
- Well EH-111, at the northwest edge of the plume, shows a generally increasing arsenic concentration trend.
- Elevated concentrations of selenium are present in the shallow and intermediate aquifers.
- Wells completed at the Northwest end of East Helena initially had arsenic concentrations below detectable limits, but now show detectable concentrations below Federal MCLs and State of Montana standards.
- The elevated selenium concentrations occur in the City of East Helena, downgradient of the plant site (see Figures 1-7 and 1-8).
- The sources of elevated selenium concentrations in East Helena area groundwater are unknown, but recent data suggest locations in or beneath the slag pile area, and near the former thaw house area. Additional characterization of potential selenium source areas will be conducted as part of the Phase II RFI.

1.2 SUPPLEMENTAL GROUNDWATER INVESTIGATION SCOPE AND OBJECTIVES

Asarco, EPA and MDEQ met in Denver, Colorado during the week of January 14, 2008 to discuss the latest groundwater monitoring data and to discuss EPA's proposed approach to groundwater remediation controls. Among the topics discussed was a strategy for supplemental groundwater investigation. This 2008 Groundwater Investigation Work Plan is based on the investigation strategy discussed during the January meetings.

The objectives of this 2008 Work Plan are:

- Augment the existing the monitoring well network with additional wells to further define the extent of arsenic and selenium migration in groundwater north of the City of East Helena.

- Augment the existing monitoring well network with additional on-plant wells to further explore potential source locations for elevated selenium observed in groundwater.
- Present the testing and sampling program for new monitoring wells.

2.0 2008 SUPPLEMENTAL MONITORING WELL INVESTIGATION PROGRAM

A total of 13 additional wells will be constructed as part of the 2008 supplemental groundwater investigation program. Nine of the wells will be located in the north City of East Helena area to provide further definition for migration of arsenic and selenium in groundwater. Four monitoring wells will be completed on-plant to supplement the existing on-plant well network and to explore potential source locations of elevated selenium concentrations in groundwater.

2.1 SUPPLEMENTAL MIGRATION MONITORING WELLS

Proposed locations for supplemental migration monitoring wells are shown on Figure 2-1. The proposed locations relative to known arsenic and selenium plume information are also shown on Figures 1-5 through 1-8.

A total of five supplemental monitoring wells (DH-118 through DH-122) will be constructed in a “halo” around to the west and north of existing intermediate aquifer monitoring wells (EH-113, EH-114, EH-116 and EH-117). These wells will be completed in the intermediate aquifer. The primary objective of these wells is to provide further definition on the potential migration of selenium to the north and northwest of East Helena in the intermediate aquifer (see Figures 2-1 and 1-6). Two additional wells (EH-66 and EH-67) will be paired with EH-121 and EH-122 and completed in the shallow aquifer. The objective of these wells is to provide additional definition of selenium in shallow groundwater north of existing shallow aquifer monitoring well EH-62 (see Figures 2-1 and 1-7).

A total of two additional wells (EH-68 and EH-69) will be completed in the shallow aquifer north of existing wells EH-54 and EH-59 (see Figures 2-1 and 1-5). The purpose of these wells is to provide further definition of the low arsenic concentration plume shown by arsenic concentrations in wells EH-54 and EH-59.

2.2 SUPPLEMENTAL SOURCE AREA MONITORING WELLS

Proposed locations for four supplemental source area monitoring wells are shown on Figure 2-2. The objective of these monitoring wells is to explore the potential sources of elevated selenium concentrations observed in on-plant groundwater, which may have resulted in elevated selenium downgradient groundwater concentrations in the City of East Helena. The proposed wells will augment the existing on-plant network. The proposed locations relative to known selenium plume information are also shown on Figure 1-7.

Two monitoring wells (DH-68 and DH-69) will be completed in shallow strata that underlay the slag pile area. These wells will augment monitoring wells DH-55, DH-56 and DH-65, which are completed in strata beneath the slag pile and show elevated concentrations of selenium.

Two additional wells (DH-70 and DH-71) will be completed at locations in a generally western direction from proposed slag area wells DH-68 and DH-69. These locations will supplement the existing on-plant monitoring well network and provide information where there presently is limited groundwater data.

2.3 CONSTRUCTION OF NEW MONITORING WELLS

Table 2-1 summarizes the 2008 supplemental monitoring well installation program. In general, the wells will be typical shallow or intermediate monitoring well construction consisting of 2-inch I.D. NFS approved schedule 40 PVC with flush joint couplings and factory slotted screen. Figures 2-3 and 2-4 and show typical construction details.

Well construction will include documentation, and sampling using procedures and techniques defined in the EPA approved IM Interim Measures Work Plan, East Helena Facility (Hydrometrics, 1999b), and the RCRA Facility Investigation (RFI) Work Plan (Hydrometrics, 2000). The wells will be construction using air rotary methods, necessary to drill through the extensive boulders, cobbles, and gravel typical of the East Helena facility

area. All new supplemental wells will be logged for stratigraphy and completed by a professional scientist or engineer.

Drill cuttings and water encountered during construction of on-site monitoring wells (DH-68, DH-69, DH-70 and DH-71) will be contained in 55-gallon drums. Excess water removed from the boreholes during the drilling process will be transported to the existing East Helena facility HDS water treatment system for treatment. Cuttings will be stored until after soil sample analyses are completed (see Section 2.4). Ultimately, on-site drill cuttings will be disposed in the Phase 2 CAMU cell.

It is not anticipated that off-site wells (EH-66, EH-67, EH-68, EH-69, EH-118, EH-119, EH-120, EH-121, and EH-122) will require containment of drill cuttings or drill purge water for environmental purposes. Concentrations metals in subsurface soils and drill purge water are expected to be low. However, cuttings and drill water may require containment for aesthetic cleanup purposes, particularly for new wells on non-Asarco-owned property such as the City of East Helena Kennedy Park area or alley right-of-way.

2.4 SUBSURFACE SOIL SAMPLE PROGRAM

As the supplemental monitoring wells are constructed, supplemental soil samples will be collected and analyzed. The sample collection and analysis matrix is in Table 2-2. Samples will be collected using procedures and techniques defined in the EPA approved IM Interim Measures Work Plan, East Helena Facility (Hydrometrics, 1999b), and the RCRA Facility Investigation (RFI) Work Plan (Hydrometrics, 2000). Samples will be collected from split spoon soil cores at intervals shown on Table 2-2. If necessary, sample soil core sampling may be supplemented by collection of drill cuttings as the borehole is advanced. All collected samples will be stored in a zip lock baggie and labeled. All sample intervals will be analyzed for total metal parameters shown in Table 2-2.

Based on total metal result, selected samples from potential source area investigation wells (DH-68, DH-69, DH-70 and DH-71) will be analyzed using the Synthetic Precipitation

Leaching Procedure (SPLP). Samples will be selected for SPLP analysis based on the amount of sample available, results of total metal analysis, and after review of available groundwater data from or near the new monitoring wells. Samples will be selected after consultation with and approval by EPA. Selected samples will also be provided to EPA for sample splits, subject to availability and EPA review and approval.

2.5 GROUNDWATER MONITORING AND TESTING PROGRAM

Following well construction monitoring, wells will be developed, tested and sampled in accordance with procedures and techniques defined in the EPA approved IM Interim Measures Work Plan, East Helena Facility (Hydrometrics, 1999b), and the RCRA Facility Investigation (RFI) Work Plan (Hydrometrics, 2000). New monitoring wells will be surged and bailed to remove drilling debris and sediment and improve connection with the completion target aquifer. Following development, the wells will be sampled for groundwater quality and tested to determine aquifer characteristics.

As described in the EPA approved Updated Monitoring Program – February 2008 (Asarco, 2008), the new monitoring wells will be incorporated into the May 2008 monitoring well sample campaign and sampled for the parameters listed in Tables A and B of that document. This program for the new monitoring wells is also summarized on Table 2-3. Groundwater samples will be collected and analyzed for field parameters, dissolved metals and arsenic, and common ions. The sampling and measurement procedures will be conducted in accordance with the IM Interim Measures Work Plan, East Helena Facility (Hydrometrics, 1999b), and the RCRA Facility Investigation (RFI) Work Plan (Hydrometrics, 2000). Concurrent with sample collection, water levels of the described monitoring wells will be measured.

In addition to water quality sampling, slug testing will be conducted on the new wells to determine aquifer permeability characteristics. Testing will be conducted in accordance with procedures described in the IM Interim Measures Work Plan, East Helena Facility (Hydrometrics, 1999b), and the RCRA Facility Investigation (RFI) Work Plan (Hydrometrics, 2000).

3.0 2008 SUPPLEMENTAL MONITORING PROGRAM SCHEDULE

Supplemental monitoring well construction is scheduled to begin the week of March 24, 2008. It is anticipated the well construction program will require four to six weeks to be completed. Following completion and well development, the wells will be incorporated into the May 2008 groundwater sample event for the existing monitoring well network.

4.0 REFERENCES

Asarco Consulting, Inc., 2003. Phase I RCRA Facility Investigation Report (revised 2005).

Asarco LLC, 2008. Updated Monitoring Program (February 2008).

Hydrometrics, 2000. RCRA Facility Investigation Work Plan, East Helena Facility, March 2000.

Hydrometrics, 1999a. Interim Measures Work Plan, East Helena Facility, April 1999, Revised July 1999. Includes Volume II, Corrective Action Management Unit Design Report.

Hydrometrics, 1999b. Current Conditions/Release Assessment, East Helena Facility, September 1998, revised January 1999.

TABLES

TABLE 2-1. ANTICIPATED* CONSTRUCTION FOR SUPPLEMENTAL MONITORING WELLS

Location	Well Name	Type	Casing Size (inches)	Area of Evaluation	Approximate Ground Surface Elevation (feet)	Approximate Static Water Level (ft bgs)	Anticipated Total Depth (feet)	Total Depth Elevation (feet)	Anticipated Screen Interval (ft bgs)
North and West Of City of East Helena	EH-118	IMW	2	Lamping Field Area	3875	30	55	3820	45-55
	EH-119	IMW	2	Lamping Field Area	3868	30	55	3813	45-55
	EH-120	IMW	2	Lamping Field Area	3860	30	55	3805	45-55
	EH-121	IMW	2	Near Storage Shed Property	3860	30	55	3805	45-55
	EH-122	IMW	2	Field North of Gail Street	3865	30	55	3810	45-55
	EH-66	SMW	2	Near Storage Shed Property	3860	30	40	3820	30-40
	EH-67	SMW	2	Field North of Gail Street	3865	30	40	3825	30-40
City of East Helena In or Near Kennedy Park	EH-68	SMW	2	Kennedy Park	3860	9	20	3840	10-20
	EH-69	SMW	2	Alley Way East Of Kennedy Park	3860	9	20	3840	10-20
Slag Pile Near Water Storage Tanks	DH-68	SMW	2	Potential On-Plant Source of Se	3935	55	65	3870	55-65
	DH-69	SMW	2	Potential On-Plant Source of Se	3935	55	65	3870	55-65
South Plant Area	DH-70	SMW	2	Supplement Existing Monitoring Network West	3912	15	25	3887	15-25
	DH-71	SMW	2	of New Proposed Wells DH-68 and DH-69	3920	29	40	3880	30-40

Note: Listed casing size is inside diameter.

ft bgs = feet below Ground Surface

Elevations in feet above mean sea level

IMW = Monitoring Well Completed in Intermediate Aquifer

SMW = Monitoring Well Completed in Shallow Aquifer

* Actual monitoring well depths and completion intervals may be adjusted in the field based on conditions encountered during monitoring well construction.

TABLE 2-2. MONITORING WELL SUBSURFACE SOIL SAMPLE COLLECTION AND ANALYSIS MATRIX

Sample Location	Purpose	Sample Types and Depth Intervals	Number of Sampling Events	Sampling Standard Operating Procedures	Analytical Parameters	Methods	Project Detection Limit Goal
EH-118 EH-119 EH-120 EH-121 EH122	Determine Areal Extent of Elevated Selenium in Intermediate Aquifer Groundwater North and West of the City of East Helena.	Sample Cores or Cuttings Sample Cores or Cuttings Sample Intervals: 0'-2' 2'-4' 4'-6' 6'-8'- 8'-10' 10'-12' 15-17 20-22 25-27 At five foot increments to Total Depth or at Major Stratigraphic Changes	1	HF-SOP-2 HF-SOP-4 HF-SOP-5 HF-SOP-7 HF-SOP-29 HF-SOP-31 HF-SOP-58 HS-SOP-6 HS-SOP-13 HS-SOP-57	(All Depth Increments) As Cd Cu Pb Cu Zn Se Al Sb Ba Be Cr Co Hg Fe Mn Ni Ag Ti V	ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 EPA SW7471 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020 ICP/ICP-MS EPA SW6010/6020	5 ppm 1 ppm 5 ppm 5 ppm 5 ppm 5 ppm 5 ppm 5 ppm 5 ppm 5 ppm 5 ppm 5 ppm 5 ppm 5 ppm 0.05 ppm 5 ppm 5 ppm 5 ppm 5 ppm 5 ppm 5 ppm
DH-68 DH69 DH-70 DH71	Examine Slag Pile Area between Monitoring Wells DH-4 and DH-55 to Determine if the Area is a Potential Source of Elevated Selenium Concentrations in Groundwater Supplement Existing Monitoring Network West of New Proposed Wells DH-68 and DH-69	Selected Intervals based on results of total metals	1		As Cd Cu Pb Zn Se Al Sb Ba Be Cr Co Hg Fe Mn Ni Ag Ti V	SPLP (EPA 1312) SPLP (EPA 1312) SPLP (EPA 1312) SPLP (EPA 1312) SPLP (EPA 1312) SPLP (EPA 1312) SPLP (EPA 1312) SPLP (EPA 1312) SPLP (EPA 1312) SPLP (EPA 1312) SPLP (EPA 1312) SPLP (EPA 1312) SPLP (EPA 1312) SPLP (EPA 1312) SPLP (EPA 1312) SPLP (EPA 1312) SPLP (EPA 1312) SPLP (EPA 1312) SPLP (EPA 1312)	0.1 mg/l 0.1 mg/l 0.1 mg/l 0.1 mg/l 0.1 mg/l 0.1 mg/l 0.1 mg/l 0.1 mg/l 0.1 mg/l 0.1 mg/l 0.1 mg/l 0.1 mg/l 0.1 mg/l 0.1 mg/l 0.1 mg/l 0.1 mg/l 0.1 mg/l 0.1 mg/l 0.1 mg/l

Notes:

- (1) Sample depths are approximate; actual depths will be based on field conditions.
- (2) Duplicates will be collected at a minimum frequency of 1 per 20 field samples. Duplicates for SPLP analysis will be submitted at a frequency of 1 per 20 for samples selected for SPLP.
- (3) Samples will be selected for SPLP analysis based on the amount of sample available, results of total metal analysis and after review of available groundwater data from or near the new monitoring wells.
Samples will be selected after consultation with and approval by EPA. Selected samples will also be provided to EPA for sample splits, subject to availability and EPA review and approval.

TABLE 2-3. GROUNDWATER TESTING, SAMPLE COLLECTION AND ANALYSIS MATRIX

Sample Location	Purpose	Sampling Frequency	Number of Sampling Events	Total Non-QC Samples	Analytical Parameters ^(4,5)	Field and Laboratory Methods ⁽²⁾	Project Detection Limit Goal (mg/L)	Field QC Samples ⁽³⁾		Total Samples
								Field Duplicates	Field D.I. Blanks	
EH-118 EH-119 EH-120 EH-121 EH122	Determine Areal Extent of Elevated Selenium in Intermediate Aquifer Groundwater North and West of the City of East Helena.	Twice Annually May and Nov.	2	52	<u>Field Parameters</u> pH specific conductance dissolved oxygen temperature SWL (static water level)	HF-SOP-20 HF-SOP-79 HF-SOP-22 HF-SOP-84 HF-SOP-10		3	3	115
EH-66 EH-67	Determine Areal Extent of Elevated Selenium in Shallow Aquifer Groundwater North of Gail Street.	Incorporated Into Site-Wide Monitoring Program (4)			<u>Laboratory Parameters</u> <u>Common Constituents</u> pH SC Ca Mg Na K HCO ₃ SO ₄ Cl TDS TSS Total Alkalinity as CaCO ₃	SM 4500H-B SM 2510 B E200.7 E200.7 E200.7 E200.7 SM 2320 B SM 4500S04 E SM 4500CL C SM 2540 C SM 2540 D SM 2320 B	 5 5 5 5 1 1 1 10 10 1			
EH-68 EH-69	Determine Areal Extent of Elevated Low Arsenic Concentration Plume North of Monitoring Wells EH-54 and EH-59.									
DH-68 DH69	Examine Slag Pile Area between Monitoring Wells DH-4 and DH-55 to Determine if the Area is a Potential Source of Elevated Selenium Concentrations in Groundwater									
DH-70 DH71	Supplement Existing Monitoring Network West of New Proposed Wells DH-68 and DH-69									
					<u>Trace Constituents⁽¹⁾</u> <u>Indicator Parameters</u> As (tot & dis) As III and V Speciation Cd (tot & dis) Cu (tot & dis) Fe (tot & dis) Mn (tot & dis) Pb (tot & dis) Se (tot & dis) Zn (tot & dis)	200.7/200.8 E 1632A M 200.7/200.8 200.7/200.8 200.7/200.8 200.7/200.8 200.7/200.8 200.7/200.8 200.7/200.8 200.7/200.8	0.005 0.005 0.001 0.004 0.02 0.015 0.005 0.005 0.02			
					<u>Supplemental Parameters</u> Al Sb Ba Be Cr Co Hg Ni Se IV and VI Speciation Ag Tl V	200.7/200.8 200.7/200.8 200.7/200.8 200.7/200.8 200.7/200.8 200.7/200.8 200.8/E245.1 200.7/200.8 200.7/200.8 200.7/200.8 200.7/200.8 200.7/200.8	0.1 0.005 0.1 0.001 0.001 0.01 0.006 0.01 0.005 0.005 0.002 0.01			

TABLE 2-3. GROUNDWATER TESTING, SAMPLE COLLECTION AND ANALYSIS MATRIX

Sample Location	Purpose	Sampling Frequency	Number of Sampling Events	Total Non-QC Samples	Analytical Parameters ^(4,5)	Field and Laboratory Methods ⁽²⁾	Project Detection Limit Goal (mg/L)	Field QC Samples ⁽¹⁾		Total Samples
								Field Duplicates	Field D.I. Blanks	
EH-118 EH-119 EH-120 EH-121 EH122	Determine Areal Extent of Elevated Selenium in Intermediate Aquifer Groundwater North and West of the City of East Helena.	2 times Annually Aug, Feb	2	52	<u>Field Parameters</u> pH specific conductance dissolved oxygen temperature SWL (static water level)	HF-SOP-20 HF-SOP-79 HF-SOP-22 HF-SOP-84 HF-SOP-10		3	3	115
EH-66 EH-67	Determine Areal Extent of Elevated Selenium in Shallow Aquifer Groundwater North of Gail Street.	Incorporated Into Quarterly Monitoring Program (5)			<u>Laboratory Parameters</u> <u>Common Constituents</u> pH SC Ca Mg Na K HCO ₃ SO ₄ Cl TDS TSS Total Alkalinity as CaCO ₃	SM 4500H-B SM 2510 B E200.7 E200.7 E200.7 E200.7 SM 2320 B SM 4500S04 E SM 4500CL C SM 2540 C SM 2540 D SM 2320 B				
EH-68 EH-69	Determine Areal Extent of Elevated Low Arsenic Concentration Plume North of Monitoring Wells EH-54 and EH-59.						5 5 5 5 1 1 1 10 10 1			
DH-68 DH69	Examine Slag Pile Area between Monitoring Wells DH-4 and DH-55 to Determine if the Area is a Potential Source of Elevated Selenium Concentrations in Groundwater									
DH-70 DH71	Supplement Existing Monitoring Network West of New Proposed Wells DH-68 and DH-69									
						<u>Trace Constituents⁽¹⁾</u> <u>Indicator Parameters</u> As (dis) Cd (dis) Cu (dis) Fe (dis) Mn (dis) Pb (dis) Se (dis) Zn (dis)	200.7/200.8 200.7/200.8 200.7/200.8 200.7/200.8 200.7/200.8 200.7/200.8 200.7/200.8 200.7/200.8	0.005 0.001 0.004 0.02 0.015 0.005 0.005 0.02		

(1) Groundwater samples will be analyzed for dissolved metal constituents (field-filtered through a 0.45 µm filter prior to preservation).

(2) Field methods HF-SOP numbers refer to Standard Operating Procedures

Laboratory methods from EPA's Test Methods for Evaluating Solid Waste, SW-846 (1992) or Methods for Chemical Analysis of Water and Wastes (1983).

For trace constituents and major cations, Method 6010 is ICP, Method 6020 is ICP-MS, and other methods are flame or graphite furnace AA.

(3) Field duplicates and blanks will be collected at a minimum frequency of 1 per 20 field samples.

(4) Analytical Schedule is the same as the "Updated Monitoring Program (February, 2008)", Table A.

(5) Analytical Schedule is the same as the "Updated Monitoring Program (February, 2008)", Table B.

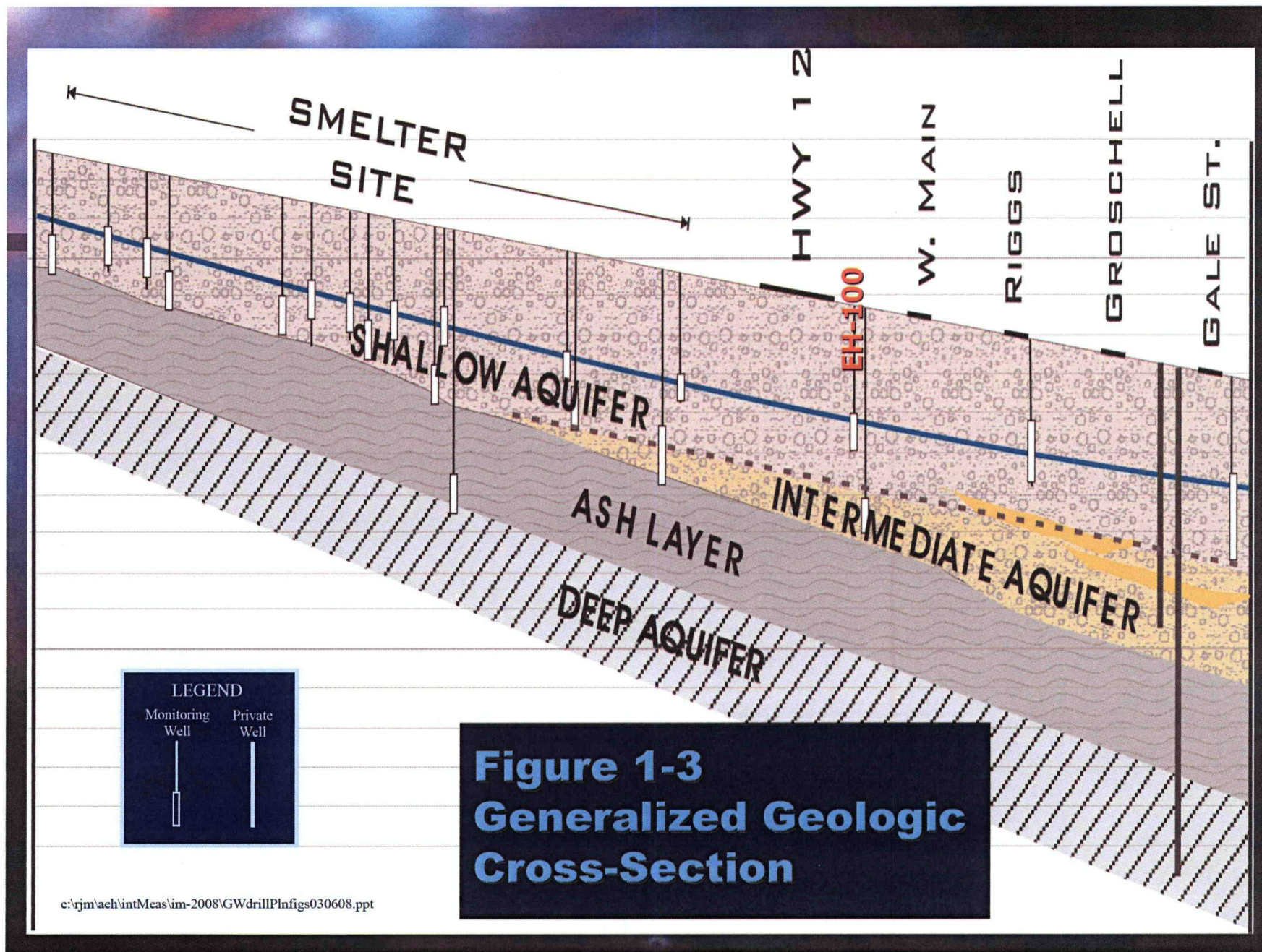
FIGURES

- ▲ Water Supply Well
- ▲ Water Supply Well in Annual Sampling Program
- ▲ Residential Water Supply Well in Monthly Program
- Municipal or Subdivision Water Supply Well
- Municipal or Subdivision Water Supply Well in Annual Program

Figure 1-1.

Water Supply Well Sampling Locations





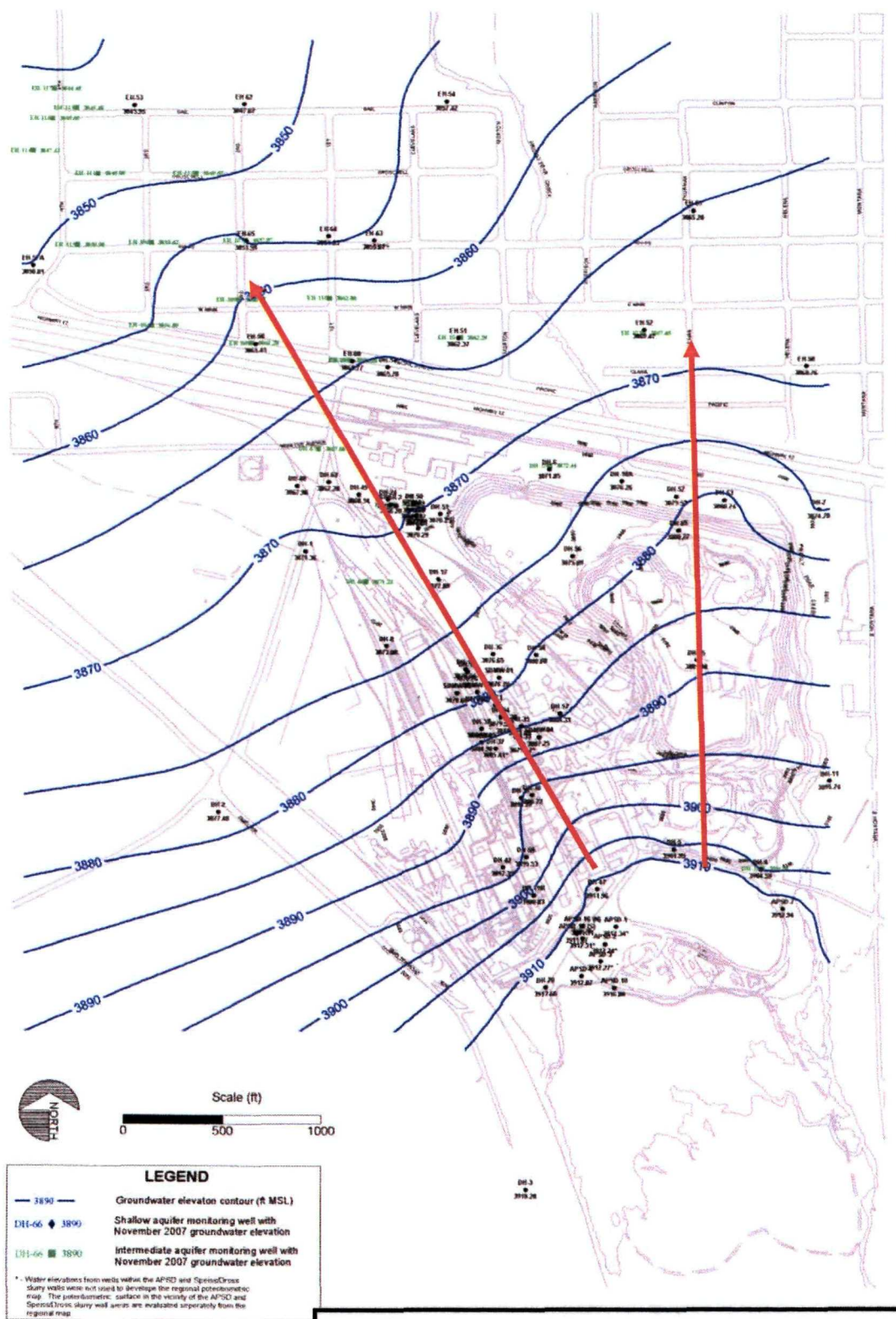


Figure 1-4. Groundwater Flow Shallow and Intermediate Aquifer – Fall 2007

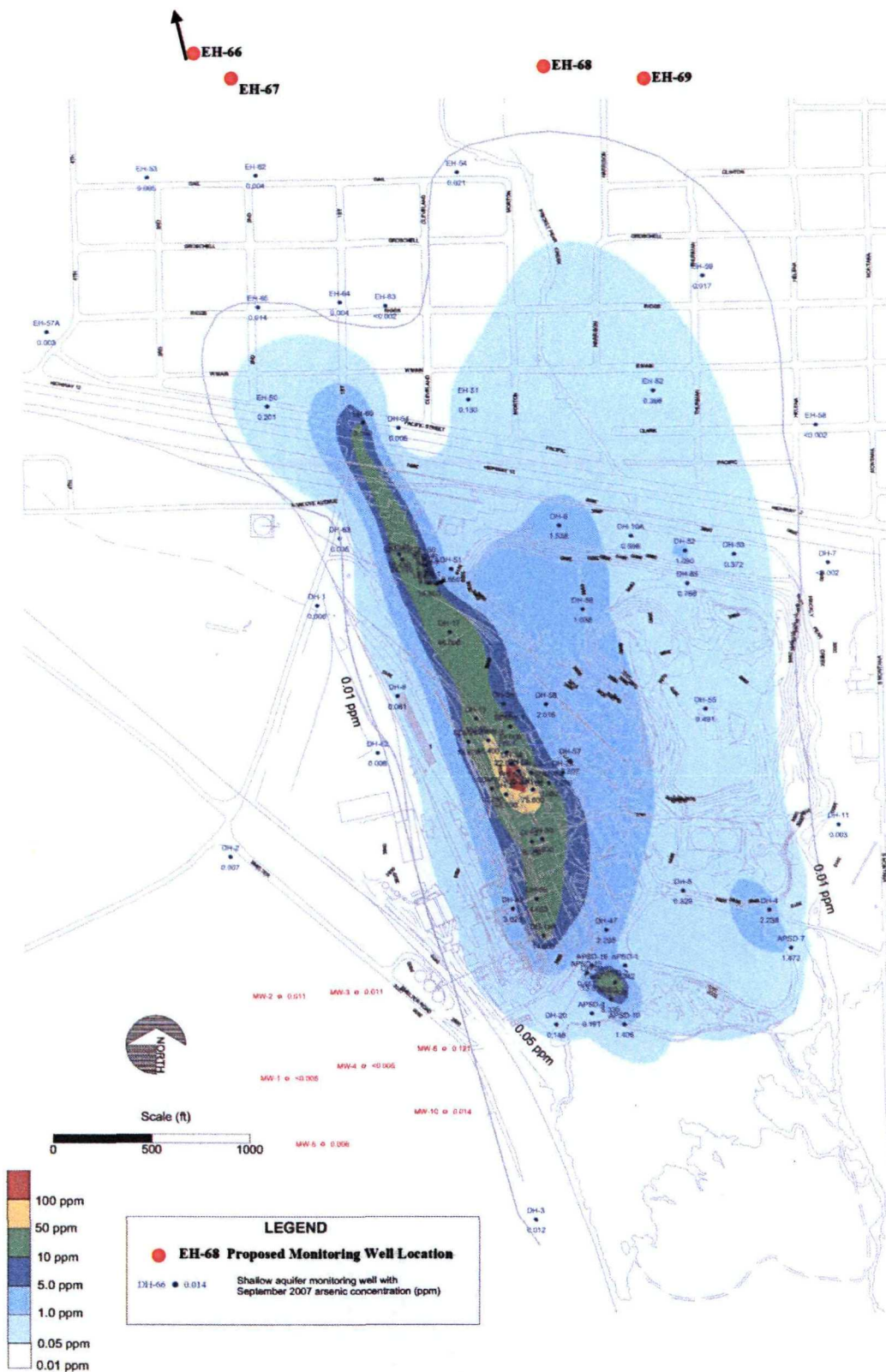


Figure 1-5
Arsenic Concentrations-Shallow
Aquifer-Fall 2007

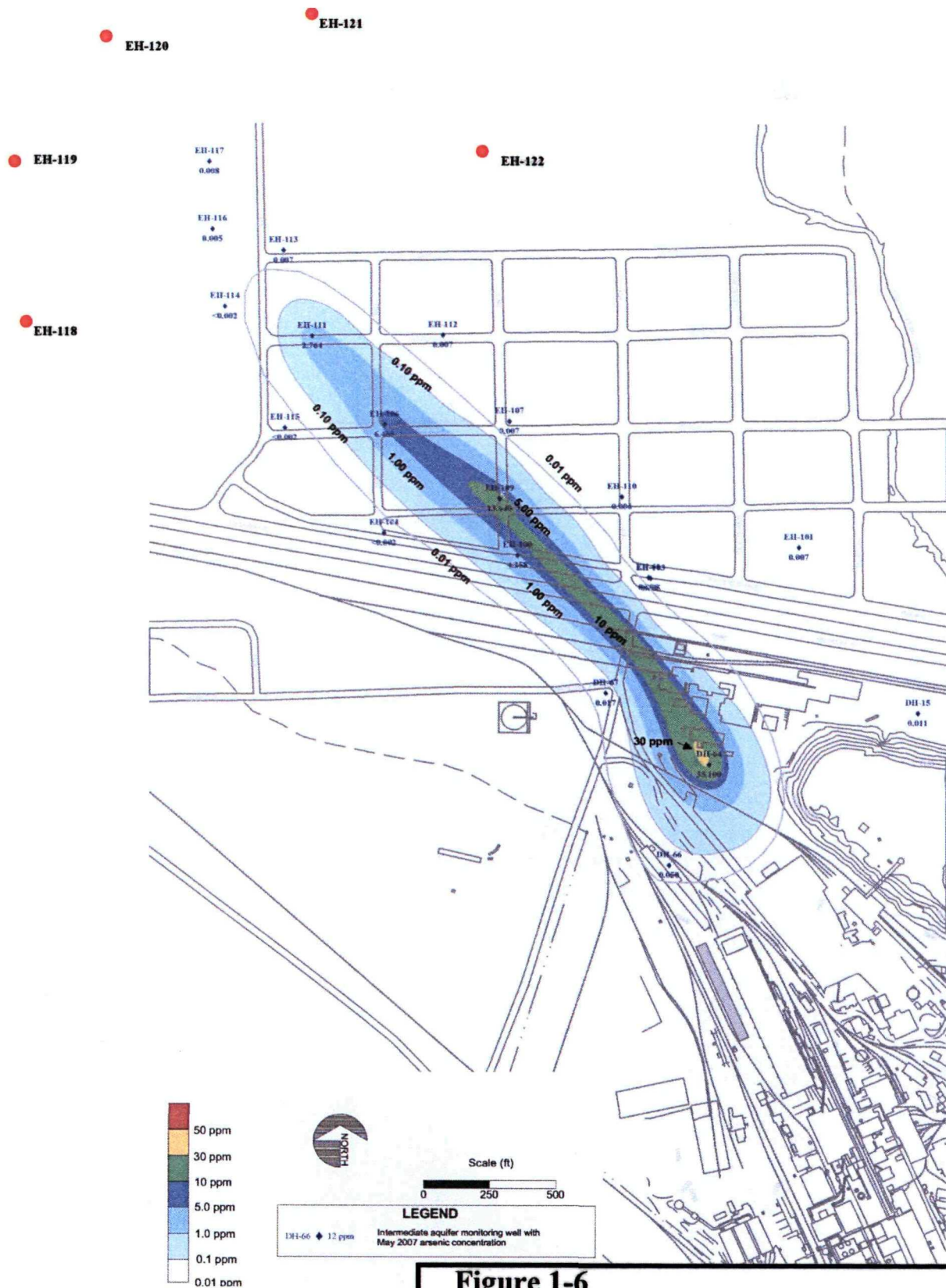
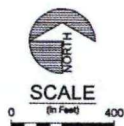
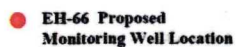


Figure 1-6
Arsenic Concentrations-Intermediate
Aquifer-Fall 2007

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EH-67



LEGEND

0.1 ppm
0.05 ppm (MCL)

Figure 1-7
Selenium Concentrations-Shallow
Aquifer-Fall 2007

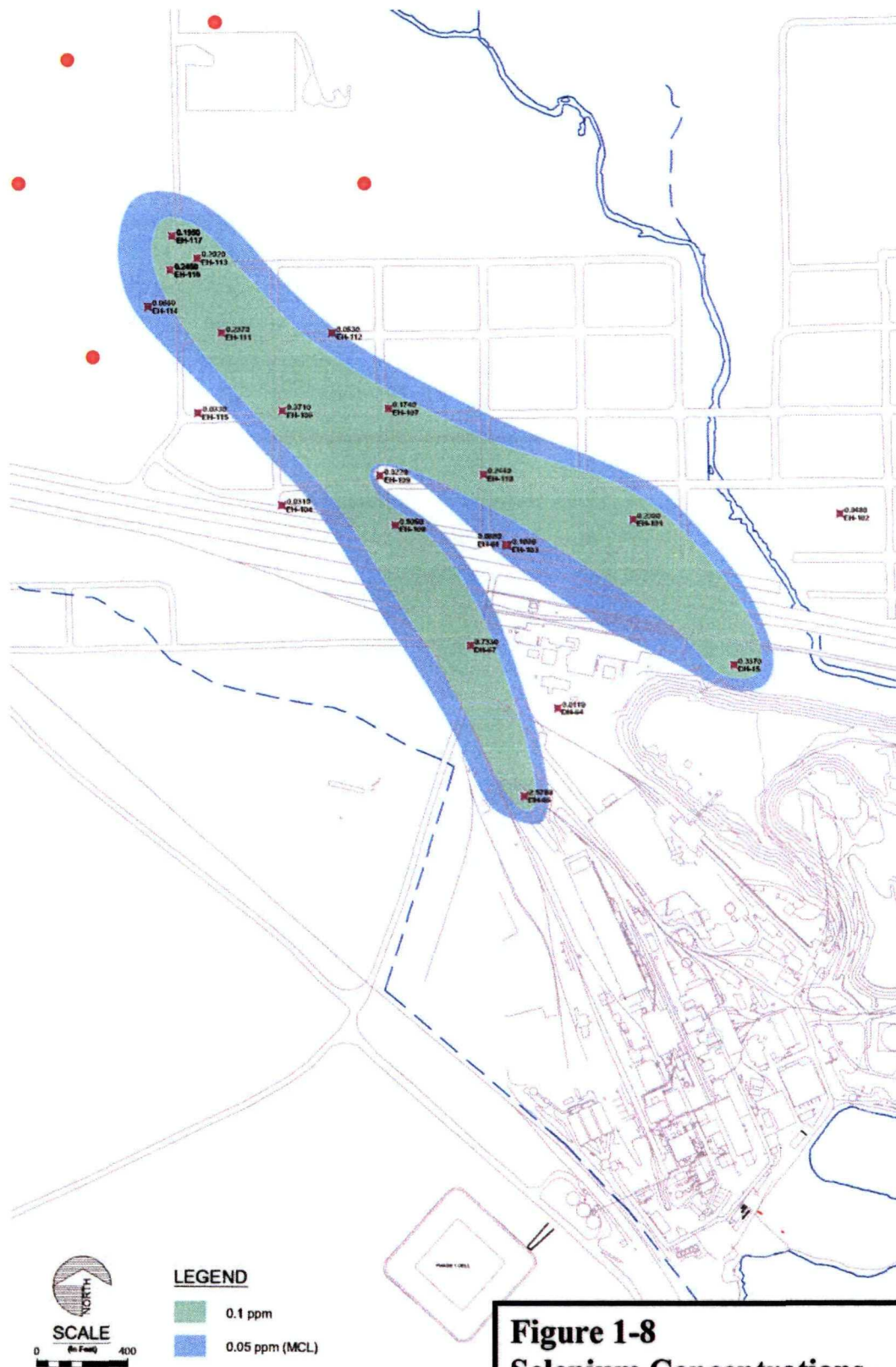
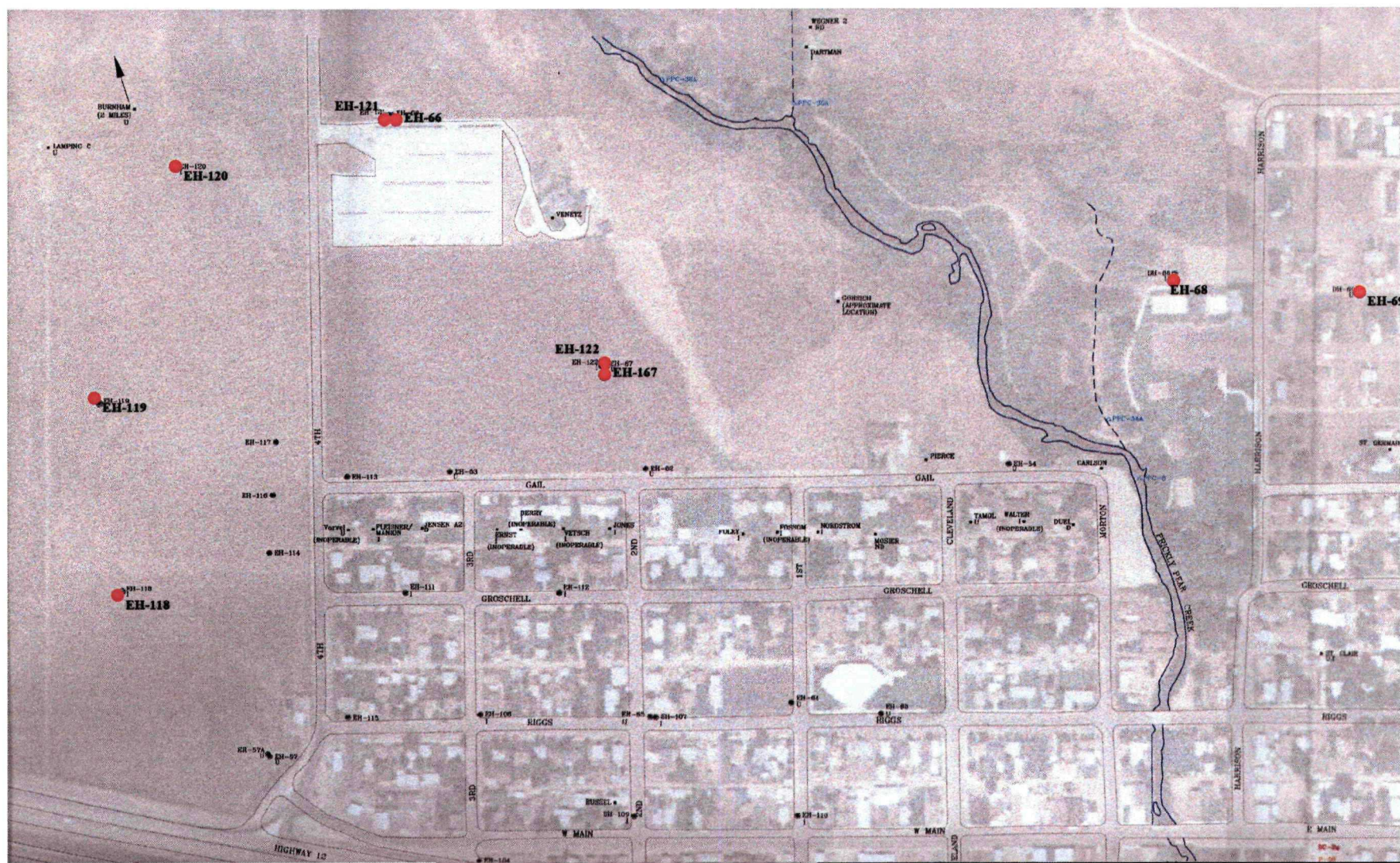


Figure 1-8
Selenium Concentrations-
Intermediate Aquifer-Fall 2007



● EH-118 Proposed
Monitoring Well Location

**Figure 2-1 Proposed 2008 Supplemental
Groundwater Migration Investigation
Monitoring Well Locations**

